

REMARKS

Applicants and Applicants' representative (Tu Nguyen) thank Examiner Tso for the courteous and productive telephonic interview on November 7, 2006.

The independent claims (1, 22, 24, 25, 37 and 39) have been amended to clarify the term "state of charge"; dependent claims 9-15 and 17 have been amended to correct grammatical errors; and new dependent claims 40-45 have been added. Support for the amendments can be found, for example, at page 9, lines 3-7, and page 22, lines 5-7. The amendments clarify the scope of the claims, and do not narrow the scope of the claims. Claims 1-45 are presented for examination.

Claim Rejections – 35 U.S.C. § 102

Prior to this Amendment, claims 1-39 were rejected under 35 U.S.C. § 102(b) as anticipated by U.S. Patent No. 6,008,623 ("Chen"), or alternatively, by U.S. Patent No. 6,373,223 ("Anzawa").

As amended, the claims recite energy storage units, each storage unit having a state of charge, which is "a fraction of a fully charged capacity for each storage unit". The claims further recite a circuit configured to monitor the state of charge, or monitoring the state of charge.

As Applicants explained in the previous response, neither Chen nor Anzawa discloses or suggests a circuit configured to monitor the state of charge, or monitoring the state of charge. Indeed, in response to Applicants' previously-submitted remarks as to what Applicants mean by "state of charge", the Examiner did not indicate that Chen or Anzawa discloses or suggests monitoring state of charge. Rather, the Examiner maintained the previous rejections based on an interpretation that "state of charge would encompass any condition or 'state' of the battery including voltage and current ..." This interpretation is inapplicable in light of the current amendments.

Furthermore, during the telephonic interview in which the current amendments were discussed, the Examiner apparently agreed that the cited patents do not disclose or suggest monitoring state of charge, as now recited in the amended claims.

As Applicants explained in the specification, monitoring state of charge, as that term is used by Applicants, can enhance battery life and safety:

In prior art techniques, charge is measured and used as an indicator of cell equalization. However, charge, which is measured in Ampere-hour (Ah), is quite different from state of charge (SOC). It is not sufficient to only measure charge in order to equalize cells, because cells having the same charge may not have the same state of charge.

For example, assume two cells have a capacity of 20 Ah. When the cells are charged to 20 Ah, both have a 4.2V potential. Assuming that full cell capacity can be utilized, the cells can be equalized to a state of charge of 50% by equalizing the charge of the cells to 10 Ah, resulting in a certain voltage less than 4.2V.

However, assume further that the two cells degrade differently, such that the first cell can only achieve a maximum capacity of 18 Ah and the second cell can only achieve a maximum capacity of 15 Ah in their respective degraded state. When both cells are charged to their maximum capacities, both have a voltage potential of 4.2V. In this case, if the two cells are equalized to an equilibrium charge of 10 Ah, the first cell would be discharged by 8 Ah and the second cell would be discharged by 5 Ah. This results in the cells having different states of charge (i.e., 56% and 67% respectively), and thus two quite different cell voltages. Hence the cells are not considered equalized.

Therefore, the method of equalizing cell charge does not become reliable for the degraded cells or for cells that are not equivalent in nature. This inability to equalize state of charge leads to low battery life and safety hazards. The low life is caused by potential deep discharge or overcharging, resulting from the inability to determine state of charge. Further, and especially for lithium-ion batteries, the overcharge or over-discharge may cause thermal runaway due to possible formation of dendrites that can cause internal shortage of the cells.

(See page 9, line 18 – page 10, line 12 of the specification.)

In light of the above amendments and remarks, Applicants request that the rejections of claims 1-39 over Chen and Anzawa be withdrawn.

New dependent claims 40-45 are patentable over the cited references for at least the same reasons that their base claims are patentable over the cited references.

Conclusion

For at least the reasons discussed above, Applicants believe the claims are in condition for allowance, which action is requested. If allowance of this matter can be expedited, Applicants invite the Examiner to call the undersigned representative.

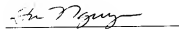
Please apply any additional charges or credits to deposit account 50-3421 (referencing
Attorney Docket No. TI01.700US).

Respectfully Submitted,

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By their Representatives,
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